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thousands of individuals. And this not only for one species but for a whole fauna, as: "A basis for an arbitrary *distinction between species and varieties* may be gained by determining a degree of divergence and of isolation which shall be used to distinguish the two. A degree of divergence of thrice the standard deviation has been suggested as a convenient line between species and varieties." The idea of such a broad application of the "newer statistical methods," and for such purposes, seems at present Utopian, because simply impracticable. Again, an arbitrary standard of deviation which may be perfectly legitimate for one group, as a genus or family, would prove inapplicable for another group of similar grade within even the same class.

As already said, the scheme is theoretically admirable, and is no doubt applicable to many special problems, but is too costly in time, material, and labor to be of the wide or general applicability in determining species and subspecies, or the methods and causes in the segregation of geographic forms, apparently contemplated by the author of the present manual. The gross methods already in vogue, being tolerably efficient for temporary and tentative purposes, will probably hold the field for a while at least, so that it will be in the remote future when, through the plotting of curves and the use of logarithmic tables, we shall see "by the use of the quantitative method biology . . . pass from the field of the speculative sciences to that of the exact sciences" (p. 39).

J. A. A.

The question of the former existence of an Antarctic continent with a flora and fauna of its own, the remnants of which are still recognizable in the southern continents, has been brought into prominence recently, and we should like, in this connection, to call attention to a paper published in Australia that, although issued four years ago, has not been noticed sufficiently in other countries. C. Hedley[1] starts from the fact mentioned already by early travelers, that Tasmania, Australia, New Zealand, South America, and partly also South Africa contain certain forms of life in common which are not represented elsewhere, and concludes that this community of type cannot be explained but by community of origin, and that we have to look for a connection of these now separated parts by former land bridges.

After discussing and criticising the theory of Hutton, which constructs this bridge across the South Pacific from Chile to Samoa and thence to New Zealand, that of Forbes, which assumes an immense Antarctic continent, and that of Pilsbury and v. Ihering, which accounts for the similar forms in South America, Tasmania, and Australia by the hypothesis of a former more extensive Austral continent which subsequently became united with South America at Cape Horn, Hedley gives his own solution of the problem. He says that "during the Mesozoic or older Tertiary, a strip of land with a mild climate extended across the South Pole from Tasmania to Terra del Fuego, and that Tertiary New Zealand then reached sufficiently near to this Antarctic land, without joining it, to receive by flight or drift many plants and animals." This "Antarctica" was of an unstable character, "at one time dissolving into an archipelago, at another resolving itself into a continent." Thus a deep gulf extended from Tasmania to Cape Horn, stretching within a few degrees of the pole, and this assumption would tend to explain some facts of distribution of marine shallow-water animals.

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[1] Hedley, C. Considerations on the Surviving Refugees in Austral Lands of Ancient Antarctic Life, *Roy. Soc. N. S. Wales.* Aug. 7, 1895.

It seems to us that this theory has some advantage over the other theories mentioned, yet it is perhaps premature to form a distinct idea as to the connection of the southern ends of the present continents. That such was present before or at the beginning of Tertiary times seems to be beyond doubt, but for the actual construction of this bridge the data at hand seem to be too imperfect. But this much we may safely assume, as Hedley does, that this bridge was no constant and solid mass all the time it existed, but was repeatedly broken up into parts, making possible an exchange of life in different directions.

The particular idea of Hedley on this subject, even if we do not at once accept it, is at least worth considering seriously, and the frequent and very complete references to previous writers form one of the features of his article that make it the more valuable for the student of this fascinating question of the "Antarctica."

A. E. O.

ZOÖLOGY.

Accessory Bladders of Turtles. — F. W. Pickel[1] has studied the accessory bladders of turtles, and finds these organs present in semi-

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[1] Pickel, F. W. The Accessory Bladders of the Testudinata, *Zoölogical Bulletin*, vol. ii, No. 6, pp. 291–301. September, 1899.